Protein compass guides amoebas toward their prey

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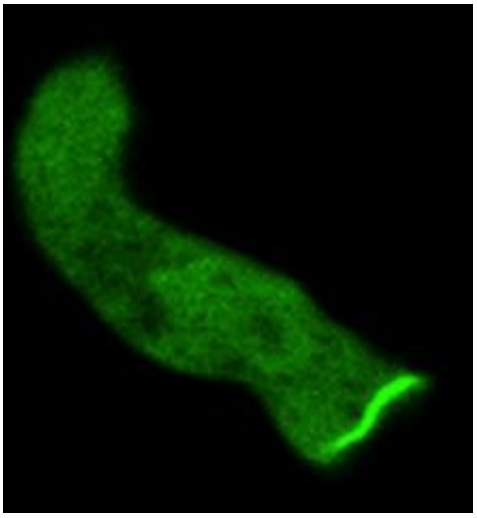

Green lights activated compass protein at the leading edge of an amoeba hunting for food. Image: Firtel lab/UCSD

(PhysOrg.com) -- Amoebas glide toward their prey with the help of a protein switch that controls a molecular compass, biologists at the University of California, San Diego have discovered.

Their finding, detailed in this week's issue of the journal *Current Biology*, is important because the same molecular switch is shared by humans and other vertebrates to help immune cells locate the sites of infections.

The amoeba *Dictyostelium* finds bacteria by scent and moves toward its meal by assembling a molecular motor on its leading edge. The active form of a protein called Ras sets off a cascade of signals to start up that motor, but what controlled Ras was unknown.

Richard Firtel, professor of biology along with graduate student Sheng Zhang and postdoctoral fellow Pascale Charest tested seven suspect proteins by disrupting their genes. One called NF1, which matches a human protein, proved critical to chemical navigation

NF1 turns Ras off. Without this switch mutant amoebas extended false feet called pseudopodia in all directions and wandered aimlessly as Ras flickered on and off at random points on their surfaces. "You have to orient Ras in order to drive your cell in the right direction," Firtel said.

In contrast, normal amoebas with working versions of NF1 elongate in a single direction and head straight for the most intense concentration of bacterial chemicals, the team reports.

The biochemical components of the system match those found in vertebrate immune cells called neutrophils that hunt down bacterial invaders, suggesting that the switch might be a key navigational control for many types of cells, Firtel said. "The pathway and responses are very similar and so are the molecules."

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Video (available here) pits mutant against normal amoeba in a race toward the scent of bacteria. A glow-tagged protein that binds only to the active form of Ras lights the leading edge of the normal cell as well as the misguided pseudopodia the mutant extends in random directions.

Provided by University of California - San Diego